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Too Embedded to Fail: The ECB and the Necessity of Calculating Europe

Stephanie L. Mudge & Antoine Vauchez [*]

Abstract: *»Zum Scheitern zu eingebettet: Die EZB und die Notwendigkeit der Berechnung Europas«*. Calling into question the meaning of "independence" in contemporary central banking, the present article investigates the social origins and post-crisis persistence of the European Central Bank's (ECB) core macroeconomic model, despite broad acknowledgement of its failure to anticipate the financial crisis. We trace the making of the model; the process by which it became dominant in European central banking and beyond; criticism in the wake of its failure to predict the financial-cum-Eurozone crisis; and its persistence, nonetheless, in the crisis' aftermath. We argue that the formation, meanings, and persistence of the ECB's model cannot be understood as effects of the bank's independence or the model's intrinsic qualities. Rather, the model's trajectory is best understood in light of the ECB's transnationally embedded social location in international finance, professional economics, and European governing institutions. The necessity of calculating Europe, irrespective of the accuracy or predictive strength of the model being used, has less to do with the ECB's independence from domestic politics and more to do with its transnational embeddedness – or, stated differently, that the ECB is, in a sense, too embedded to fail.

Keywords: Central banks, Eurozone, scientization, economists, forecasting, field-theory, European Central Bank.

1. Introduction

The European Central Bank's (ECB) position in Eurozone governance as an "anchor of stability" is tightly connected to its reputation as a scientifically-grounded central bank that operates at a distance from both domestic politics and Brussels-based inter-state bargaining (Marcussen 2009; Fontan 2013; Mudge and Vauchez 2016; Vauchez 2014). Indeed, cross-bank analyses of "independence in personnel matters," "financial autonomy," and "policy inde-

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pendence" rank the ECB among the most highly independent central banks in the world (de Haan and Eijffinger 2000). And yet "independence" has a historically specific meaning: the term is a twentieth century construction, born of an era dominated by sovereign nation-states in which central banks were distinguished mainly by the degree to which they were beholden to domestic politics, or what Seymour Martin Lipset called "the democratic class struggle" (Lipset 1960). In European politics "independence" involved removal from partisan politics in a double sense – both domestic and inter-state. In both senses, the ECB is, indeed, highly independent.

And yet organizations can have many sorts of dependencies. A central argument of the present article is that the new realities of central banking suggest the need for a fundamental rethinking of the practical meaning of "independence." Modern central banks are highly independent from partisan influences, but independence from the democratic class struggle is not the same as independence *in toto*. Rather, the moment calls for a new approach that moves toward a critical understanding of the organizational and institutional situation of central banks with attention, in particular, to their inter-, trans-, and supranational embeddedness.

At least three broad transformations in central banking merit such a rethinking. First, the transnationalization of financial and monetary government since the 1990s entailed a decline in the power of party-appointed national ministers of finance relative to public and private financial and monetary elites – including, among the latter, central bank governors (Polillo and Guillén 2005; Lebaron 2010, 2013; Major 2014). A second transformation was central banks' "scientization," or a broad shift in central bank organizations toward acting more like scientific or academic research centers, and less like public, political, or government institutions (Marcussen 2009; see also Mudge and Vauchez 2012, 2016). A third transformation was the rise and diffusion of a new modeling technique in central banking: dynamic, stochastic, general equilibrium (or DSGE) models that ground "a full-system Bayesian likelihood estimation approach using key macro-economic variables" in "microeconomic behavioural foundations" (Smets et al. 2010, 52).

The first two transformations mark the embeddedness of central banking in decidedly non-national and extra-partisan worlds: namely, transnationalized and international finance and internationalized professional economics. The third transformation, meanwhile, originated in a specifically European location: the ECB – or, more specifically, the ECB's Directorate for Research (DG Research), through the efforts of Frank Smets, DG Research Director (later special adviser to Draghi) and Rafael Wouters, an economics professor at the Belgian Central Bank. Advancing simultaneously the ECB's tasks of forecasting and policymaking, its pursuit of professional and scientific credibility, and its role in the broader effort to remake Europe as a single market, the Smets-Wouters model performed "Europe" as a single macroeconomic unit and be-

came one of the ECB's most acclaimed scientific exports. In this sense, a technical shift in the modeling techniques of central banking bore the imprint of the ECB's rapid formation as a materially and symbolically powerful player among Europe's governing institutions.

Soon after, however, the US-*cum*-Eurozone crisis took hold. In this context a curious thing happened: criticized for not having anticipated bank defaults and the effect of the financial crisis on the "real" economy, DSGE modeling was widely acknowledged as having failed to predict the crisis. In some quarters this fed into broader indictments of macroeconomics as a whole. And yet neither the ECB nor professional macroeconomics abandoned DSGE modeling. Instead, failure resulted in a series of justifications and *ex post* fixes, even as the approach's status as a macroeconomic tool grew apace.

Taking up the origins and post-crisis persistence of the ECB's model, and building on previous work, the present contribution makes two arguments. First, in order to understand contemporary central banking – including, in the present case, resistance to change in the wake of a crisis – the socio-economics of central banking has to grapple with how central banks' transnational embeddedness shapes their activities, organization, internal dynamics, and technical activities, including their modeling techniques. Second, we argue that the scientific status of DSGE modeling, because of its specifically European origins, is inextricably wrapped up with the justifiability of Europe as a market-making project, and that this is key to its crisis-resistant nature. In other words the model, like the ECB, is too embedded to fail.

The paper proceeds as follows. We first lay out our conception of modeling techniques as financial, governing, and professional devices that express the transnational embeddedness of the ECB. We then mobilize interviews, scholarly publication data and bank publications in to show how the ECB's Smets-Wouters macroeconomic model's origins and development were patterned by the ECB's multiple fielded situations. Showing that the ECB's modeling technique's accelerating prominence in macroeconomic scholarship coincided with the unfolding of the financial-*cum*-Eurozone crisis, we sketch out critical attacks on it, *ex post* rationalizations of its predictive failures, and its persistence in the crisis' wake. In the conclusion we argue that understanding the model's imperviousness to apparent failure requires a shift away from the twentieth century problematic of independence and toward that of transnational embeddedness. Such a shift entails a concern with the ways in which Western central banks, however independent with respect to domestic politics, remain fundamentally political institutions that are deeply involved in the material and symbolic operations of contemporary governing institutions – such that, in the present case, the calculation of "Europe" is at least as much a political as a scientific necessity.

2. Models as Financial, Governing, and Professional Devices: The Case of the ECB

As we have argued elsewhere, the ECB's formation is difficult to grasp without attending to its origins within, and ongoing situation with respect to, at least three transnational fields: "the world of central banks and other financial institutions, the European political order, and the internationalized economics profession" (Mudge and Vauchez 2016). Focusing on the ECB's unusual degree of scientization ("hyper-scientization"), our prior research shows that the ECB's organizational structure and internal activities are patterned by European governing institutions' efforts at the accumulation of symbolic power, and that the otherwise mundane activity of data collection and analysis doubles as a means to bureaucratic authority (ibid.).

In the present paper we extend this line of work to the analysis of the formation of the ECB's modeling capacity. We are not interested here in the relationship between models and the market, but rather in how central banks' modeling techniques – arguably the most routine and diffuse form of expertise to be found within central banks (Braun 2015) – express the structure and logic of today's financial, economic, and monetary governing institutions. We take up the case of the ECB in order to "transnationalize" the sociology of central banking (Go and Krause 2016), to contribute to sociological understandings of the ongoing effort to construct "Europe" as an economic and monetary union (see Georgakakis and Lebaron 2018; Schmidt-Wellenburg 2017), and to recover a concern with the political in the socio-economics of (transnationalized) central banking by moving beyond the question of independence.

The ECB's bid to secure monetary "stability and confidence" in a unique institutional context – namely, a changeable, highly fragmented political system of variably sovereign member states, each having monetary institutions with distinctive histories – infuses the development, performance, and scientific reputation of its econometric model with unique significance. The development of a model of the European economy is not a strictly technical process. Rather, it was (and remains) wrapped up with struggles over the scientific and justificatory status of the ECB and, by extension, the whole project of economic and monetary integration.

Following the state-building literature, we consider knowledge techniques as an essential lever for states or quasi-states to establish their jurisdiction over competing holders of authority (church, feuds, charted cities, etc.).[1] In Western

[1] In a very rich and diverse literature, see the seminal book by Alain Desrosières (2002), Pierre Bourdieu's Lectures at the *Collège de France* on the state (2015) and the important project on the genesis of the modern state in Europe led by Wim Blockmans and Jean-Philippe Genet (1997).

Europe, the historical monopolization of "informational capital" (censuses, statistics, national accounts) allowed for a "theoretical unification" of the territory and of the corresponding population under the control of the emerging state bureaucratic apparatus (Bourdieu 1994, 3, 7). In other words, the informational prerogative progressively acquired by state bureaucracies (and the related capacity to assess, compare, and predict) paved the way and legitimized the practice of modern government.

Similarly, in the case of the EU, the task of denationalizing the economy, essential to the effort to build the Eurozone as a single and relatively autonomous economic unit, was much more than a matter of statistical calculation; it was also an important step in the European accumulation of symbolic power. Macroeconometric models can thus be analyzed as a key means of the formalization of "Europe as Eurozone" with its own value-objects (financial stability), institutions (the ECB), and professional groups (central bankers, financial regulators, ECB watchers), at the expense of a whole range of other institutions and social actors, especially of non-supranational and non-financial sorts: local and regional institutions, political parties, national ministries and ministers, national diplomats, European Commission bureaucrats, etc.

However, while forecasting and simulation exercises are levers for central banks' jurisdictional claims (Abbott 1988), they are also socially-situated activities that express the history and configuration of the institutional settings in which they emerge. To this we now turn.

3. Analytical Approach

To better understand the effort to model "Europe" as a historical and institutionally-situated process, and in particular to reconsider the practical realities of "independence" in the case of the ECB, we consider the trajectory of the ECB's macroeconomic modeling before, during, and after the Great Recession. Despite (or maybe because of) the ECB's undisputed reputation as a bastion of European scientific economic research (Mudge and Vauchez 2016), most ECB-related literature renders the process by which it produces, constructs, and defines *"*Europe*"* as a singular economic entity a black box. This is particularly true to the extent that the ECB's expert production has been a self-contained undertaking. Existing research offers little sociological and historical insight into the macroeconometric models and forecasting tools with which the ECB diagnoses the state of the Eurozone, produces policy scenarios, and defines monetary policy.

By contrast, we consider the production of economic expertise, and especially the making of the ECB's modeling capacity, as an expression of the ECB's many scientific, professional, and political entanglements. To this end, we view forecasting activities not as a purely "mechanical process of inputting

data to a sequence of equations for the purpose of yielding a discrete policy stance" (Adolph 2013, 94), but rather as a bricolage as famously coined by Claude Lévi-Strauss (1963) – that is, a "*science du concret*" through which practitioners continuously craft new arrangements in view of changing demands, contingencies, and oft-conflicting logics. Underlying our focus on modeling techniques is an assumption that there is a relationship between the institutional locations of those engaged in *bricolage*, the way they see the world, and the devices and techniques they produce.

We are therefore interested in the profiles and trajectories of modelers; the many attempts, provisional instruments, hesitations, failures, contradictions, and interpretative adjustments that have structured the modeling of the Eurozone; and the trajectory of the model itself as a means to grappling with the character and social location of the ECB. Our working hypothesis is that both the *construction* and the *trajectory* of the ECB's model of the "European" economy, like the formation of the ECB itself, bear the imprint of three fields: the scientific and professional world of globalized economics; the European political and bureaucratic field; and the technocratic field of transnationalized finance (Mudge and Vauchez 2016).

Our prior research on the transnational embeddedness of the ECB structures our working hypotheses. On the scientific and professional side, we expect to see that ECB modeling activities were grounded in, and dependent upon, a specifically "European" economics, and that self-understood European economists were central to professional efforts to denationalize or "Europeanize" economic knowledge – in part by producing, assembling, and repurposing statistical and analytical techniques. On the political and bureaucratic side, we expect that the making of the ECB's model of Europe was closely linked with, and dependent upon, a dense web of political and bureaucratic policy demands grounded in the emerging government of the Eurozone. On the side of transnationalized finance, we expect modeling to be shaped by competitions across national central banks and international economic organizations.

With these propositions in mind, we track the formation and transformations of ECB's modeling in context – that is from the "second stage" of the economic and monetary unification (1994-2000), when the need to craft a whole "technology of expertise" (Everson 2012) for the Eurozone started to be felt, up to the Great Recession and aftermath. We consider how the ECB's *methodological entrepreneurs* (Vauchez 2015) crafted new knowledge instruments for calculating Europe's state of (economic, monetary, and political) affairs and built new arrangements in the context of the financial crisis. Keeping in mind the cross-field location of the ECB, we also focus on *epistemic alliances* between ECB modelers and networks grounded in scientific, bureaucratic, and financial and monetary fields. Empirically, we draw on a wide range of sources that include ECB official documents and working papers, on- and off-site interviews with economists involved in European modeling efforts (academics,

economists at the European Commission, the *Banque de France*, current and former members of ECB Forecasting unit, current and former members of ECB DG Research[2]), and reviews of journals and conference proceedings on macro-econometric modeling.

Our story begins in the late 1990s, with the first efforts to model "Europe."

4. The ECB's Formation as the Eurozone's Chief Economist

The first Eurozone macroeconometric model, the so-called Area-Wide Model (AWM), started to be crafted in 1997 in the context of the European Monetary Institute (EMI), the ECB's predecessor. While the ECB's official aim, taken directly from the Bank of England, was to develop a "suite of models" based on different paradigms suitable for a variety of policy and expert purposes, by January 2001 much emphasis was put on the identification and publicizing of the Bank's (singular) "core model." As the first macroeconometric model to grasp the specific dynamics of the Eurozone, the core model bore the mark of the position of the EMI (and, from June 1, 1998, of the ECB) in the emerging Eurozone governing institutions.

Far from being isolated in Frankfurt, the EMI was – like the ECB now – enmeshed in a dense political and technocratic web of relations. The EMI had been created in 1994 as part of the "second stage" of the process of unification. An "interim institution" set up as a prefiguration of the ECB (which would emerge in the third and last stage), the EMI was tasked with engaging a tighter coordination of monetary policy among national central banks (NCBs) and preparing "the instruments and the procedures necessary for carrying out the single monetary policy" (Article 109f, TEU 1992). In other words, the EMI worked closely with NCBs.

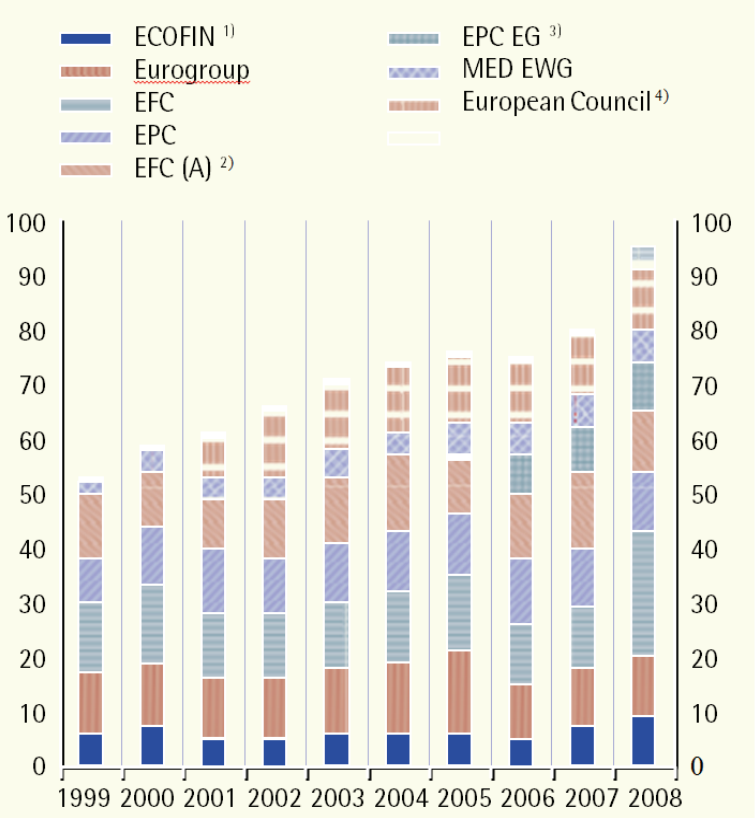
The ECB, created in June 1998, was then born in tandem with the Eurogroup, an informal, non-treaty-based body made up of the finance ministers of the Eurozone countries, the EU's Vice-President for Economic and Monetary Affairs, and the President of the ECB (Mudge 2015). From the beginning the ECB was closely associated with this informal venue of Eurozone finance ministers and its powerful preparatory committees of top civil servants.

As the ECB "transformed from a mere talking shop into what increasingly looks like a policy-making institution" (Pisani-Ferry, in Hodson 2011; also Grosche and Puetter 2008), it became a player in efforts to address the "shared

[2] Our interviews were made in two waves: first in March 2015, with ten on-site interviews conducted, with managers and staff across four ECB directorates, six of whom had been with the ECB for ten years or more – that is, for most or all of its years of existence; second, in September 2016 with four interviews with Eurozone modelers (one at the European Commission, two at the *Banque de France*, one at the European Central Bank).

specific challenges" that had justified the creation of the Eurogroup governance structure in the first place [see Figure 1]. Figure 1, published in the ECB's *Monthly Bulletin* (ECB 2010), provides a rough indication of the ECB's growing political and bureaucratic involvements between 1999 and 2008.

Figure 1: Number of Attended Meetings per Year and per Body



Source: ECB.
5) Includes informal ECOFIN.
6) EFC Alternates.
7) EPC Eurogroup Working Group.
8) The European Council and the EU Council in the composition of Heads of State or Government.

Source: ECB Monthly Bulletin (2010, 82).

The ECB's immersion in the Eurozone's political and bureaucratic networks shaped, in turn, the pace and rhythms of its expert activities. In the run-up to

the euro, practical and policy-oriented questions went well beyond the area of monetary policies. How would the Eurozone react to external shocks? How would it perform economically in comparison to other monetary systems (especially that of the United States)? How efficiently was monetary policy working with the real economy? All these policy-related issues suggested a need for forecasting instruments capable of representing the euro area as a single unit, or single economy, beyond national economies.

This was felt all the more because of the emerging doctrine of the ECB. The "two-pillars doctrine," embraced by the Governing Council in its October 1998 meeting, called for the surveillance of medium and long-term economic indicators. Inspired by its Chief Economist Otmar Issing, formerly a top official of the German *Bundesbank*, the doctrine called for the assessment of the overall goal of "price stability" by monitoring monetary and non-monetary (*i.e.* economic) risks such as "labour costs, fiscal policy statistics and financial market indicators like bond yields, stock prices and exchange rates" (Issing 2004). Issing's call for a euro area toolbox dovetailed with the broader teleology of European monetary union – which, in the context of an ever-growing EU, rendered "national borders increasingly insignificant for business, investment and economic policy decisions" and, by extension, called "for a new generation of macroeconomic models to analyse the key economic aggregates for welfare and forecasting purposes, at both the euroarea level and the national level; and the policies appropriate to them at either level" (Hallett and Wallis 2002).

The *comité des gouverneurs,* the European Communities' committee of central bankers (which has existed since the 1960s), had long engaged in the effort to harmonize "monetary aggregates" and establish joint monetary surveillance, but the delineation of economic forecasting as a Eurozone jurisdiction was new. None of the institutions that made up the government of the Eurozone had the capacity, at the time, to handle the task. The EMI had neither aggregated data nor an appropriate modeling technique at its disposal. There were country-specific and multicountry models, but they could not provide the euro area perspective for which policymakers called: neither the MULTIMOD, developed in the International Monetary Fund (IMF) Research Department in Washington, nor the NIGEM, produced at the National Institute of Economic and Social Research, nor the QUEST model, crafted by the Directorate General for Economic and Financial Affairs of the European Commission (Roeger and in't Veld 1997), offered an *integrated*, non-national approach. IMF modelers defended the multicountry model, since "it was key for EU policy makers to develop an in-depth understanding of how economic disturbances may affect the union's major economies differently," but political and bureaucratic demands for a uniform perspective overwhelmed concerns with the "potential disparities that could arise across the major European economies" (Hunt and Laxton 2004). The widely held belief among EU policymakers that the single currency would trigger "convergence" among Member States (Verdun 2011),

just like the single market had done, diminished concerns expressed by US academic economists, in particular, on the risks and uncertainties of monetary unification in terms of national disparities within the euro area (Tagourdeau and Vincensini 2009; Jonung and Drea 1999).

In its annual report of 1997, the EMI highlighted the urgency of building a comprehensive econometric infrastructure for monetary union. To that end, a small team of economists had been put in place: a dozen of modelers, drawn from national central banks the first staff of the EMI's "Macroeconometry" Working group (part of the so-called "Stage 3" Division). As one of their members recalled, the group worked "like a think tank," although they were soon "seen by their peers from national central banks as doing science fiction" (interview A, ECB 2017). While the "skeleton of the model" was ready in 1997, the Area Wide Model was completed in May-June 1998 (interview A, ECB 2017).

However it was not until the end of the 2000 that the AWM had officially become the ECB's "core model." In December 2000, the ECB Governing Council decided to publish macroeconomic projections twice a year. A month later, the bank's Working Paper Series gave details about "the quarterly estimated structural macroeconomic model for the euro area," namely the AWM (Fagan, Henry and Mestre 2001), designed for use in these broad macroeconomic projection exercises undertaken by ECB staff for policy analysis.

In light of emerging political and bureaucratic demands within the Eurozone, the AWM was a critical innovation. It was based on the assumption that there were such things as Eurozone "representative agents" (consumers, producers, etc.), regardless of the heterogeneity of behavior or institutional differences across countries. All of the model's equations related to area-wide variables, making possible the very first estimates of Eurozone macroeconomic behavior. The model was heralded for offering four types of usages: "the assessment of economic conditions in the euro area, macroeconomic forecasting, policy analysis and deepening understanding of the functioning of euro area economy" (Fagan, Henry and Mestre 2001). Thereby, the AWM was a significant stride toward denationalization, allowing the ECB to "deal more appropriately with issues relating to the growing integration of member countries" and "an area-wide focus in general economic analysis and policy discussion with the Eurosystem" (Fagan, Henry and Mestre 2001).

5. Integrating the Central Banking Community

Thoroughly enmeshed in the dynamics of the EU, the ECB also had to struggle to secure a position for itself in the rather crowded and competitive playing field of financial and monetary institutions (NCBs, IMF, Fed, etc.). The bank's modeling capacity was crucial in this regard. As shown in the existing litera-

ture, exchanges and relations in international networks have increasingly taken the form of forecast-related discussions in which models "serve as the framework of disciplined discussions and interpretations" (Adolph 2013, 89; Braun 2015). In this context, economic or monetary institutions that do not run their own macroeconometric model risk remaining at the margin of the international professional community. Since these models make economically coherent stories about the past and future possible, they are important entry tickets into transnational, financial professional circuits (Beckert 2013, 2016).

This was, at first, far from obvious for the EMI (and later the ECB), given the complexities of its relationship with national central banks (NCBs). In a context in which NCBs, in a sense, "own" the ECB,[3] its autonomy from the Eurosystem was far from obvious. Quite tellingly, the three main AWM modelers, Fagan, Henry, and Mestre, had been selected from NCB-centered professional breeding grounds. Jérôme Henry, who had joined the EMI in 1995 at the age of 34 to become Forecasting coordinator, had been a full-time researcher and a senior economist in the Macroeconomic Unit of the *Banque de France*; Henry came from France's traditional "state economist" career pathway through *Polytechnique*, the ENSAE (France's leading school of economics and statistics, directly attached to France's National Institute of Economic and Statistical Information [INSEE] and the French Ministry of Economy and Finance) and a position at the *Banque de France* (Lebaron 2000). Gabriel Fagan, a PhD from Trinity College Dublin who had been nominated as the Head of the Monetary strategy section of the EMI, had been an economist of the Irish Central Bank and had worked at the Committee of Governors in Basel. Last but not least, Ricardo Mestre came from the Spanish Central Bank, where he had been working on macroeconometric models of Spanish monetary policy. Moreover, the small EMI forecasting team was working in tight connection with their NCBs' interlocutors in the "Forecast and Macroeconometric" Working Group, which brought the NCBs and the ECB modelers together four times. In other words, the initial forecasting efforts of the ECB were deeply grounded in the Eurozone's transnational network of central bankers.

The ECB's capacity to have a voice of its own within the Eurosystem was further undermined by the non-existence of aggregated Eurozone data. As the ECB's first Chief Economist, Otmar Issing, a former Bundesbank manager, indicated in hindsight,

> the situation that prevailed at the start of the ECB [was] extremely worrying. Some important data were simply not available at all for the Euro Area: for example, export and import prices indices, or data on output in construction or

[3] From its creation, the capital of the ECB is held by the national central banks of the Member States as shareholders. The initial capital allocation key was determined in 1998 on the basis of the member states' populations and GDP.

> the service sector which accounts for no less than some two – thirds of total GDP. (Issing 2008, 83)

Unsurprisingly, the collection and aggregation of consistent data became a critical challenge for the EMI's forecasting unit – not only in the area of monetary policy, where it had to be able to assess "money demand" (Browne, Fagan and Henry 1997), but also in the field of macroeconomic data.

Here again, the making of the "official back data for the Eurozone"[4] meant building a complete harmonized and aggregated historical dataset for the Eurozone reaching back to the 1970s, through an intense collaboration with national central banks. To deal with the many practical difficulties involved (e.g., the unequal number of variables, the absence of data for East Germany before reunification, etc.), ECB modelers engaged in a number of bricolages to fill in the blanks, particularly by "backdating" data to the first quarter of 1970 using extrapolation methodologies.

Building a unique dataset was not, however, enough. The next challenge was to demonstrate that there was no aggregation bias deriving from the union of data from different countries. Meeting this challenge was essential to establishing the reliability of Eurozone modeling. The methodology was initially tested for the building of indicators to assess "monetary demand" with a presentation at the Econometric Society's European Meeting in 1997 (Fagan and Henry 1998). It would then be extended for macroeconomic data in 1999 (Henry 1999) and, more extensively, in 2002, in a paper presented by ECB modelers at a Conference on "Empirical models of the euro area economy" (Bonn, Germany, June 2002) that included modelers from the ECB, the IMF, and the Commission. Happily, the paper showed that "on the basis of empirical work conducted over the recent years on a number of key economic relations" that "the comparative loss of the aggregate approach as opposed to the multi-country one seems to be somewhat limited" (Dieppe and Henry 2004).

6. Establishing the ECB's Scientific Credentials

There was, however, a last venue in which the ECB had to establish its legitimacy: the scientific community. The fact is, at the time, there was no scientific consensus that Europe's monetary integration was either feasible or realistic (Mudge and Vauchez 2016, 154-5; see also Dyson 2009, 5). The overall context for the emergence of the ECB was one of general skepticism, in particular among US-based academic economists who had been vocal critics (Tagourdeau and Vincensini 2009). And so the need to endow the ECB with an organizationally-based research capacity had been recognized by the bank's designers

[4] On the progressive empowerment of ECB statistical capacities, see Fontan 2012 and 2015.

as a key priority from the start, with the model of the US Federal Reserve specifically in mind (thereby departing from the French and German central banking tradition) (Mudge and Vauchez 2016). In a context featured by the "scientization of the art of central banking" and the rise of a "scientistic technospeak" (Marcussen 2009), the ECB's capacity to craft its own scientifically-grounded, macroeconometric model was essential to establishing its stature as a scientific, data-driven central bank which did not draw its forecasts on mere intuition or insiders' knowledge (Duchatczek and Schubert 2004).

In this respect, the AWM was insufficient because it was not innovative enough; AWM modeling was generally aligned with what other central banks were doing at the time. AWM was emblematic of the traditional macroeconometric forecasting tools that had been used by central banks since the 1970s, based on observed past correlations and the compilation of a large amount of economic and financial variables.

A strong academic critique of this type of modeling had been around since the 1970s. The "Lucas critique" (1976) pointed out the structural limitation of the traditional Keynesian macroeconometric tradition for taking the main functions and variables as invariant, exogeneous to changes in policy variables, insensitive to future expectations, and thus incapable of providing a dynamic, structural picture of the economy. The critique was further developed in the 1980s by two prominent economics professors, Thomas Sargent from New York University and Chris Sims from Princeton University (Sims 1980). Both suggested new theoretical solutions for structural and dynamic macroeconometric modeling, a contribution for which they would later receive the "Nobel Prize" (Fève and Collard 2012). This vibrant stream of academic research prompted a new set of models, the Dynamic Stochastic General Equilibrium (DSGE) models, which factored in stochastic shocks, as opposed to existing neo-Keynesian models of the 1990s (such as the AWM) that were backward-looking and planned on a stable future and perfectly self-adjusting markets. In addition, the new DSGE models lent "micro-foundations" to macroeconomic modeling by assigning an important role to "rational expectations," a view "embraced by policy makers at central banks" (Linde, Smets and Wouters 2016, 2190). At the time of the publication of the AWM, DSGE models were becoming a new scientific standard.

In 2003 and 2007 the ECB published two working papers by Frank Smets and Rafael Wouters that attempted to import the DSGE modeling into the Eurozone (Smets and Wouters 2002, 2007). Neither author was part of the Macroeconometric Unit in which the AWM had been initially crafted. Rafael Wouters (1960) was a senior researcher at the Belgium Central Bank; Frank Smets (1964), the son of an important central banker who in 2018 is currently Governor of the Belgium Central Bank (Jan Smets), had joined the ECB in 1998 as Research principal in DG Research, thereby starting a successful career in that unit from head of division (2002), to deputy director (2005), and eventually

director (2008) Directorate General in 2008 – after studies at the University of Gent, a PhD at Yale (1988-1992), and some time spent at the Bank for International Settlements, or BIS (1992-1998) in Basel.

Smets and Wouters' model drew from the new quarterly Euro area macro data, built for the purpose of the AWM, and thus had the same area-wide aggregated perspective. But it differed "from the more traditional macroeconometric models such as the AWM" by bringing in the most recent theoretical developments of DSGE models (ECB website archived). While this was not entirely new in the world of central banking, Smets and Wouters introduced an important methodological innovation: up until then, the DSGE's key parameters were "calibrated," meaning that modelers relied on their informal *savoir-faire* and economic knowledge. Drawing on the work of Chris Sims, Smets and Wouters applied new methodologies (VAR projections) that would allow them to estimate the model. While some academics, like Larry Cristiano from the Northwestern University and Frank Shorfheide, had opened the way to this in the preceding months, their effort was on a more limited scale; Smets and Wouters provided a "doable technical way" to estimate the model empirically. This methodological innovation proved critical in the emerging field of DSGE models, allowing Smets and Wouters to claim a more scientific approach to forecasting that did not require one to "fudge the factors as you do in other approaches" – in the words of a key promoter of the new methodology, Macro Del Negro, of the New York Federal Reserve. To this De Negro added that "if you fudge the forecasts, you'll never know for sure. To put it differently, we are trying to be 'serious' econometricians" (Del Negro 2017). The ECB thus became a means of assembling macroeconomics' theoretical insights, econometric methodologies, and "European" data into a new modeling strategy capable of 'knowing for sure.'

While the scientific reputation of the Smets-Wouters proposal grew rapidly, it should be said that such a success story ran against all odds. The model came from outside academia, was developed in Europe, and had been published in a second-tier journal – specifically, in the first-ever issue of the European Economic Association's own journal, the *Journal of the European Economic Association* (Smets and Wouters 2003; EEA 2015). A key element of the success story was the early endorsement of the paper by Chris Sims himself, who presented it as an authentic breakthrough in the year it was published. In Sims' words:

> A recent paper (Smets and Wouters 2002) apparently represents the first example of a DSGE that has been fit to data and produces a fit that is competitive with that of a Bayesian reduced form VAR. […] While it explains just nine variables, it was put together by two researchers in a relatively short span of time. With the resources of a central bank research staff and computational equipment, the same methods should work on models of the scale of current central bank primary models. On the face of it, this makes obsolete the wide-

> spread belief that rigorous dynamic theoretical modelling and good statistical fit are incompatible. (Sims 2002)

The second critical test of the scientific legitimacy of the model came with its application using American data. Results of this effort, published in the prestigious *American Economic Review*, successfully estimated the model for the United States' economy (Smets and Wouters 2007).

The Smets-Wouters model's rapid success peaked between 2008 and 2010. Smets and Wouters' two key papers, published in 2003 and 2007, have been among the most cited papers in economics – a striking performance for papers written in macroeconometrics. Today, the 2003 and 2007 papers rank respectively 119th and 152th in the Repec articles database, which counts the total number of downloads over time [see also Figure 2, below].[5]

Increasingly recognized as a "cornerstone of modern macroeconomics" (Fernández-Villaverd 2010), the Smets-Wouters model proved equally influential in the field of central banking, where it set the stage for a new generation of models that appeared more scientifically-grounded than the traditional Multimodel of the IMF, the FRB model of US Federal reserve, and the AWM of the ECB (Tovar 2009). The revolution started in the ECB, where the model helped to generate a profound reframing of its "core model" for the quarterly macroeconomic projection exercises. In 2008, a new team of ECB modelers (Christoffel, Coenen and Warne 2008) officially introduced the so-called "New-AWM" which was presented as a "micro-founded open-economy model for the euro area" (and in fact for that reason bore little resemblance to the previous model). Within DG Research, it provided a "seminal reference" (interview B, ECB 2015) and template, since no other scientific production coming from the ECB had ever encountered such success. As indicated by an ECB modeler, "the Smets-Wouters model has been the Holy Grail for the storytelling of previsions. Similarly, it is probably no stranger to the exceptional career of Frank Smets," who is widely considered to have "been probably the most famous researcher in the ECB" (ECB interview C, ECB 2015). Smets became Head of the DG Research in 2008 at the age of 44, then Draghi's Special advisor in 2013, and was recently chosen to lead the Bank's main directorate, DG Economics.

In the context where the DSGE models attracted increasing attention from central bankers and international financial and monetary organizations from around the world, the methodological leap that made the New-AWM possible also served as a reference point for a whole DSGE community – which was, at the time, centered on international financial and monetary institutions. While national central banks and international economic organizations have continued to rely heavily in practice on more traditional forecasting methodologies (less

[5] Accessed March 3, 2018.

based on models than on "experts' judgments"), the traction and clout created around the Smets-Wouters DSGE modeling proved unstoppable. As early as 2006, a German professor of macroeconomy from Humboldt University, Harald Uhlig, indicated that:

> The Smets-Wouters model has become a modern workhorse and benchmark model for analyzing monetary and fiscal policy in European central banks, and is spreading to policy institutions in the US as well. (Uhlig 2006)

In 2008, the European Commission published an updated version of its own traditional QUEST macroeconometric model, QUEST III, which adopted the same micro-founded approach and estimation methodology of Smets-Wouters, while at the same time adapting them for the sake of the Commission's policies and missions. As QUEST III introduced "a government sector with stabilizing demand policies" and fiscal policies, it provided DG Ecfin with a relevant tool for the study of stabilization policies (Ratto, Roegerand Veldt 2008). In 2016 former IMF Chief Economist Olivier Blanchard pointed out that "a standard reference [for DSGE model] remains the model developed by Frank Smets and Rafael Wouters (2007)" (Blanchard 2016).

On the whole, then, the ECB proved able to bridge the gap between advanced academics and forecasting activities, establishing a new scientific standard for the 'art' of forecasting in the context of central banks. This, in turn, was key to securing the ECB's reputation as a legitimate, scientific independent central bank, despite professional doubt at its beginnings and its invention *de novo* as an institution committed to operating at a healthy distance from Brussels's politics of inter-state bargaining. The model did not, however, serve its most explicit purpose: prediction. Instead it utterly failed to anticipate the coming financial crisis, and was widely acknowledged (and criticized) for this reason. DSGE modeling, nonetheless, proved to be too professionally and bureaucratically embedded to fail. To this we now turn.

7. Too Embedded to Fail: The Model's Survival of the Crisis

As the Smets-Wouters model was proving to be a watershed event for the scientific status of the ECB and European economics more generally, the Great Recession and the financial crisis came as a shock. The New-AWM did not predict the crisis or its effects. In this context mounting criticism emanated from international economic organizations, US academic economics, and EU political and bureaucratic quarters. The ECB "core model" was criticized for being both unrealistic and unscientific in terms of assumptions, and for having failed as both a predictive and an explanatory tool. But, despite the widely recognized failure of DSGE models to capture interactions of finance and the real economy, the global crisis did not disqualify the ECB's DSGE core model, the New-Area Wide Model, N-AWM; instead, it merely prompted revisions

and, for some, a distancing from the scientific rationale behind the model – being, namely, that it was capable of prediction.

The first wave of criticisms came from international financial organizations, for failure along predictive and explanatory lines. The Smets-Wouters model used seven macroeconomic time series (real GDP, consumption, investment, hours worked, real wages, prices, and a short-term interest rate) and represented three "agents" (consumers, firms, and the ECB), but *omitted any consideration of banking and finance and its relation to the real economy*. This was not, in theory, impossible – indeed, the professor-turned-central-banker Ben Bernanke had, in 1999, integrated a "financial accelerator," using time series for the interest rate spread (Bernanke, Gertler and Gilchrist 1999), an indicator later included as "financial frictions" by Linde, Smets and Wouters (2016, 2257). But, as a member of the DSGE modeling community indicated, finance was not accounted for in the model:

> We didn't have a banking sector; we were probably a little lazy […]. We didn't see the depth of the crisis. There was little on the housing sector. We had models and we did a study in 2004 published in the WP series: we looked at the housing sector and saw a risk; but we had a little benign view about that; we thought the housing boom in Greece, Portugal was a logical outcome (demographical, low interest rates, etc.) we thought there would be an easy transition; we had problems identifying the size of the housing sector; we had to resort the extraneous factors; it was difficult to identify what was related to the fundamentals and what was a bubble that is a "fall in the risk premia." (Interview D 2017)

The other assumptions on which the model was based were also criticized, including especially the existence of "representative agents," which underestimated heterogeneity within categories (e.g., household) and across countries.

More broadly, a critique of the "analytical monoculture" of central banks and international financial organization emerged, which pointed to the "underestimation of uncertainty" and called for a "new respect for disciplined eclecticism and the use of several paradigms side by side" (Bronk 2011). These critiques led to the establishment of "diversity of thought" (sic) program within the ECB, alongside "Diversity Days@ECB," with speakers from academia and public life who discuss a whole range of diversity-related topics" (ECB 2017).

Some of the sharpest criticisms came from economists linked to academe and financial institutions. Influential economists attacked the Smets-Wouters model as having brought macroeconomics into an unrealistic era. In a particularly controversial attack on modern macroeconomics in general, Paul Romer, a New York University (NYU) economics professor who would become World Bank Chief Economist in the very same year (2016), noted that the Smets and Wouters model "was hailed as a breakthrough for DSGE econometrics," and yet "what matters in the model is […] imaginary forces" (Romer 2016, 7). Coining the term "post-real models" to describe contemporary macroeconomic techniques, Romer contended that "empirical DSGE models put sticky-price

lipstick" on the "RBC [real business cycle] pig." On his way out of his position as Chief Economist of the IMF, Olivier Blanchard offered a milder, but still critical, view of the shortcomings of DSGE models, noting "unappealing" assumptions that are "at odds with what we know about consumers and firms" and "unconvincing" estimation methods (Blanchard 2016).

Critiques also extended to the uselessness of DSGE models for European political and bureaucratic purposes due to the aggregation of all Eurozone economies. Here more or less explicit criticisms pointed to the ECB's excessive insistence on euro-area-wide models, especially given the recurrent diagnosis of increasing divergence across member states. Eurozone aggregation had led to an underestimation of divergence among the 12 Eurozone countries, critics charged. ECB Board member Benoît Cœuré insisted in 2012, for instance, that "in recent years, at the ECB and comparable institutions, country modeling has risen in prominence" because

> smaller countries [read Greece], and in particular the EU/IMF programme countries, whose impact has usually been small relative to euro area developments, have extensively contributed to increased area-wide volatility. (Cœuré 2012)

Dependence on Europe-wide modeling became especially problematic as the ECB shifted its practices in the wake of the crisis and the unequal cross-national distributional consequences of ECB policies attracted political criticism. As pressure mounted, some at the ECB exhibited a certain guilt recognition – in 2012, for instance, Cœuré noted that "our models did not predict the crisis and provided only limited policy guidance when it struck" (Cœuré 2012). In 2016 Smets and Wouters likewise acknowledged the "new challenges" facing central banks' structural macroeconomic models, given that

> the intensification of the crisis in the fall of 2008 was largely unexpected and much deeper than central banks predicted and […] the subsequent recovery was much slower. (Linde, Smets and Wouters 2016, 2186)

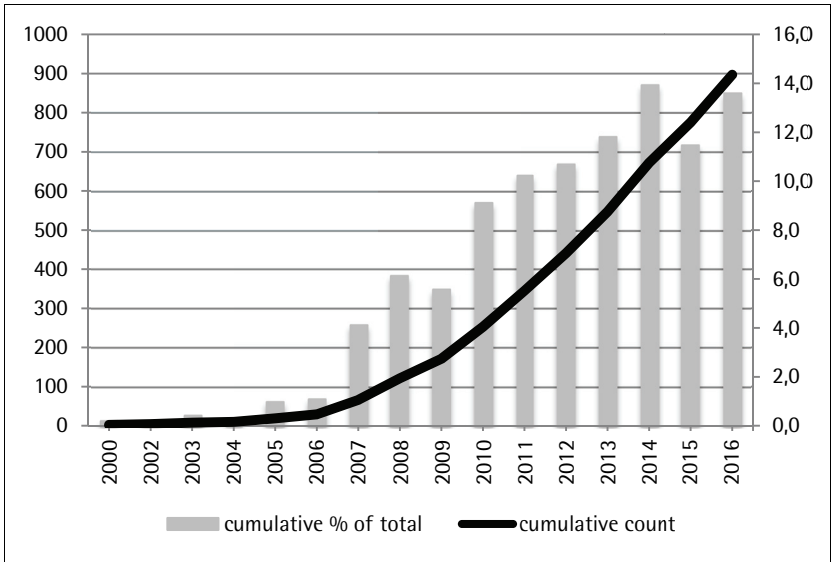
"Apart from failing to predict the crisis in the first place," they added, "both the BVAR and the DSGE model have a clear tendency to forecast a quick recovery" (Linde, Smets and Wouters 2016, 2207).

After exploring certain extensions to the model – namely, allowing for a zero lower bound constraint on nominal interest rates; introducing "time variation in the volatility of the exogenous disturbances," and including a financial accelerator while allowing for "time variation in the endogenous propagation of financial shocks" – Linde, Smets and Wouters concluded that, still, such extensions could "not suffice to address some of the major policy challenges" (Linde, Smets and Wouters 2016, 2186). The ECB's task had been complicated by the crisis, particularly given the ECB's "use of nonstandard monetary policy" ("Large-Scale-Asset-Purchases and other credit easing policies") and creation of a "new macroprudential policy domain" aimed "at containing systemic risk and preserving financial stability" (Linde, Smets and Wouters 2016, 2186-8).

In other words, by 2016, the assessment of the progenitors of modern central bank macroeconomic modeling was that post-crisis central bank policy practices exceeded the capacity of the technique to adapt.

And yet, scientifically speaking, DSGE modeling shows no sign of abatement. Even in the wake of the crisis and waves of professional criticism on "post-real macroeconomics," DSGE modeling hardly declined in scholarly prominence. This is indicated in Figure 2, which tracks the cumulative count of Econlit-listed articles dealing with DSGE modeling.

Figure 2: Econlit Articles with "DSGE" in Abstracts, 2000-2016



Note: Search conducted on January 30, 2018. Author calculations.

As the Figure 2 shows, DSGE-related articles follow the beginning of an S-shaped diffusion curve without reaching, as of 2016, the end of the "S". Similarly, the *Staff forecasting guide* of the ECB that delineates the procedure and core practices in the Eurosystem still brings the N-AWM to the forefront.

Unsurprisingly, the ECB invested heavily in shoring up the legitimacy of DSGE modeling. In the face of criticism, ECB managers and modelers deployed a variety of adaptive, or maintenance, strategies that allowed the bank to keep the Smets-Wouters type of modeling at the core of its forecasting methodology (Abbott 1988). A first adaptation consisted of fixing the Smets-Wouters model by addressing the major flaws brought to the fore during the crisis. A number of ECB Working papers updated the model specifically on the issue of financial transmission and attempted to fix the model by addressing its major flaws:

bringing more heterogeneity (e.g., in the household sector) and more frictions in the model, and adding relevant transmission mechanisms (Smets 2010).

A second move has been a return to the "suite of models'" doctrine that reaffirmed the importance of multi-country models and of "satellite models" as necessary complements to the "core model." Reacting to Blanchard's call for more pluralism in modeling, former vice-president of the ECB insisted that central banks should

> not rely on a single model and a single modelling paradigm. I could not agree more with Blanchard who recently expressed his view that also other types of general equilibrium models beyond DSGEs are useful policy tools […]; alternative types of models will continue to be part of central banks' toolbox. (Costancio 2017)

Yet, while DSGE modeling in general and the Smets-Wouters model in particular have been harshly criticized since the crisis, no real alternative or attempt to return to the pre-DSGE mode of long term modeling has emerged at the ECB. While some interviewees mention "a little bit of hype for the agents-based models – as a better way to look at coordination problems," in modeling conferences (Interview E 2017), these have exclusively developed in academic centers such as the Institute for New Economic Thinking (INET) in Oxford (funded by George Soros); they have not made their way into the ECB.

A third adaptive strategy consisted in nuancing and shifting expectations towards DSGE models. One example is efforts to highlight their non-forecasting functions – that is, that they should be understood as vehicles for "telling economically coherent stories and structuring forecast-related discussions," to use the words of the ECB modelers' team (Smets et al. 2010). Another effort to shift expectations involved new emphases on "expert judgment,"[6] for instance, in the first *Staff Forecasting Guide* (ECB 2016), which indicated that "while the Eurosystem/ECB staff projection exercises are model-based, the final projections may incorporate a fair amount of expert judgement" (ECB 2016).

Last but not least, some ECB modelers suggested a heavier reliance on nationally-specific expertise, emphasizing "the euro area picture [that] emerges from an aggregation of individual country forecasts (produced either by NCBs or by ECB country experts)", while adding however that the N-AWM remains *the* model "used to interpret these euro area figures and to help build a related area-wide 'story'" (ECB 2016).

This is not the place to assess whether these maintenance strategies will be effective in the long run, or whether the N-AWM is now more of a façade hiding the continuing importance of expert judgements' forecasts and pre-DSGE types of modeling among euro area NCBs. We are more interested in

[6] This more relativistic turn prompted further criticisms by Paul Romer: "'all models are false' seems to have become the universal hand-wave for dismissing any fact that does not conform to the model that is the current favorite" (Romer 2016, 5).

what this great care put in safeguarding and revamping the ECB's core paradigm (despite its utter failure to anticipate the dynamics of the Great Recession) reveals. In light of the historical trajectory of the paradigm as delineated here, the Smets-Wouters model appears as a key component of a *hinging apparatus* (Abbott 2005) that marks the ECB's transnational embeddedness in professional economics, central banking activities, and the EU polity.

Yet, at the same time, hinges condition scientific, economic, and bureaucratic rewards. In a context in which the ECB has grounded its authority as a new central bank that is more scientific than its counterparts, it is not surprising that the Smets-Wouters model has come to play a critical defining role in the ECB's institutional identity. While it may not correspond to "reality," it has become an essential discursive tool used as means of communication, or exchange, with its interlocutors, NCBs, the IMF, and academics.

DSGE modeling may not be of daily use for the economic expertise that the ECB produces at the Eurogroup or at the Economic and Finance Committee but, still, modeling marks an essential legitimizing ground for ECB claims-making as the Eurozone's Chief Economist. Deeply entrenched as it is in all sorts of standard operating procedures, repertoires of justification, and analytical toolboxes, and embedded in the supranational trio of professional economics, European governing institutions, and transnational finance, the Smets-Wouters model has, thus far, proven highly resistant to decline or fundamental change.

8. Conclusions

In this paper we have shown that neither the making nor the post-crisis persistence of DSGE modeling can be fully understood without placing it in the context of the ECB's formation – which requires, in turn, situating the ECB with respect to at least three transnational systems of relations: professional economics, transnationalized finance, and EU institutions. DSGE modeling became a central bank practice and scientific standard not only because of the ECB's scientific and policy mandates, but also thanks to the ECB's linkages with other central banks on the one hand and its investments in the prestige competitions of scientific economics on the other.

Symbolically, the ECB model was deployed in the name of 'proving' the unity of the European economy – but, as we have seen, the status of this 'proof' has been curiously impervious to the wisdom of experience. The financial crisis, for many, undermined the model's capacity to serve as proof; by extension, if DSGE modeling was truly a purely pragmatic predictive and policy-making tool, it would surely have been discarded in the wake of the financial crisis. And yet, grounded in a network of modelers and, more importantly, in the transnationalized world of central banking, thus far DSGE modeling has proven to be too embedded to fail.

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